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CENTRAL INTELLIGENCE AGENCY

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50X1-HUM

COUNTRY Poland

REPORT

SUBJECT New Polish Graduating Frequency
Generator: Description and Use
in Air-Ground Communications

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Decade Frequency Generator (Dekadowy Generator Czystodliwosci).

The document describes the characteristics of a generator of this type developed in 1959 by the Telecommunications and Radio Technical Institute (Instytut Tele-i Radiotechniczny), Warsaw; components were imported from the USSR

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The equipment is used by military airfield personnel for direction finding and communications; a diagram showing methods of jamming Radio Free Europe signals is included in the document.

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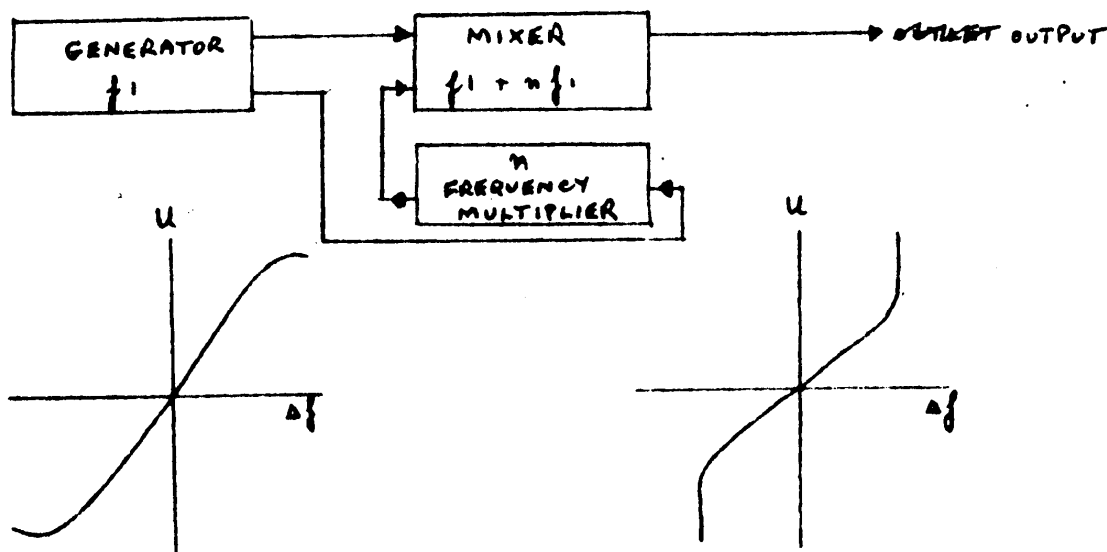
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SECRETDecade Frequency Generator

There are various methods of obtaining different frequencies from a quartz crystal. In the more complex circuits, use is made of automatic generator tuning, taking advantage of the characteristics of reactance valves and phase discriminators.



Graph of a phase discriminator

Graph of a reactance valve

Difficulties in re-tuning

If a given radio transmitter is operating on a given frequency, and wishes to change over to another frequency, it has to change the quartz crystal controlling the frequency. It is therefore necessary to have a number of plug-in crystals, together with resonance circuits. Much difficulty is thus caused by the storage of a large number of crystals, which take much time and expense in manufacture.

A further difficulty is the necessity to have a highly-qualified personnel and large cupboards for the storage of these circuits.

The ideal solution, therefore, is to construct such equipment which, with the use of only one crystal, will supply any required frequency by means of certain adjustments, which may take the form of steps /literally: 'jumps'/, but which must be as accurate as a crystal.

Establishment of communication between an aircraft and an airfield

The landing of aircraft, and, previous to that, the radio communications of military aircraft, takes place by means of a carefully

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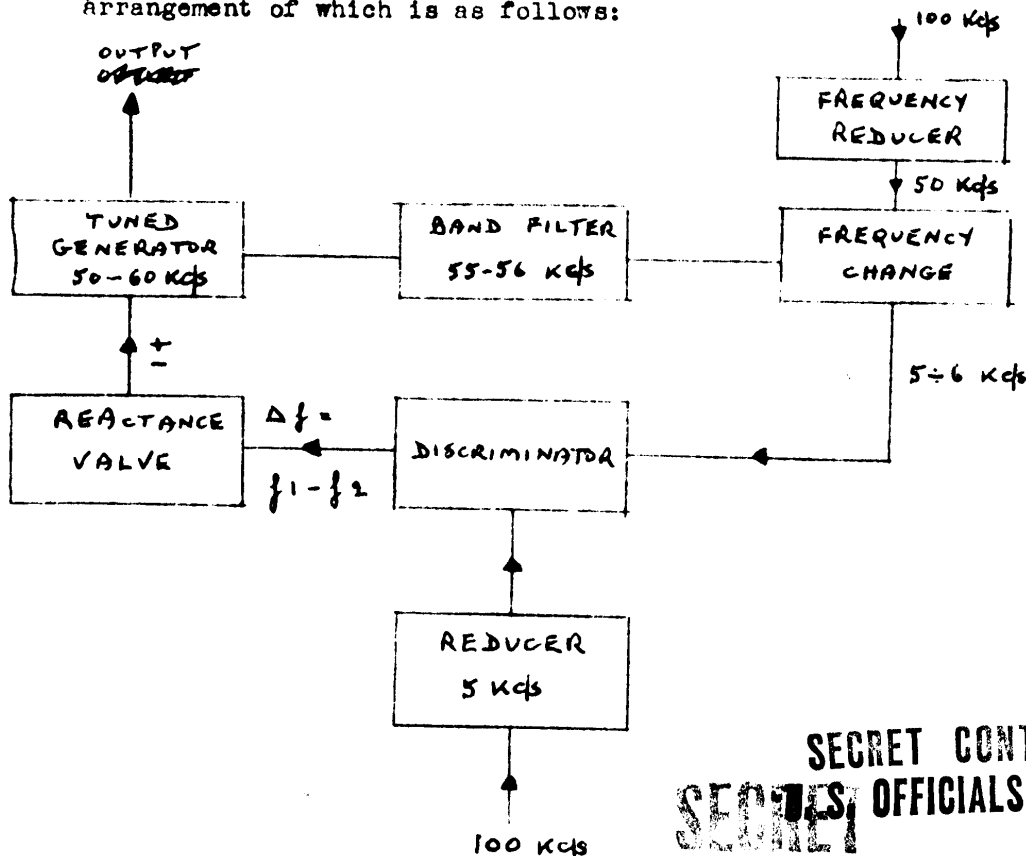
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planned code. This code forms an obstacle to enemy monitoring devices, which otherwise could jam the transmitter. Great accuracy is required in tuning the transmitters. For this reason, the transmitters on the aircraft and on the airfield or aircraft carrier, must be of a high standard and, above all, must have a device for stabilizing the frequency. The /main/ stabilizing element is the generator with the quartz crystal, and ~~there is~~ it is also necessary to stabilize the temperature, pressure, and degree of humidity, and to take into account the aging /of the crystal/.

The crystals are grown in the KASPRZAK Radio Works out of tiny crystals which, at an appropriate pressure and temperature, grow into large crystals. These large crystals are cut flat, are polished to specified limits, and are silvered on both sides. Outlet leads are then soldered to them, and a test is made of their frequency in operation. The frequency can be corrected by further polishing.

Taking advantage of these characteristics, the Tele- and Radio-Technical Institute in WARSAW (INSTYTUT TELE I RADIOTECHNICZNY) constructed, in 1959, a Decade Frequency Generator, the general arrangement of which is as follows:



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Each decade is constructed in the same way, with the exception that there is no kilocycle reducer in the succeeding decades, while the discriminator is controlled by the tuned generator of the lower ~~matter~~ decade. In this way, the lower decade influences the frequency setting of the higher decade.

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The resistors were Polish

The ~~condensers~~ ^{capacitors} were imported

from various countries, ~~British~~ Poland, Russia

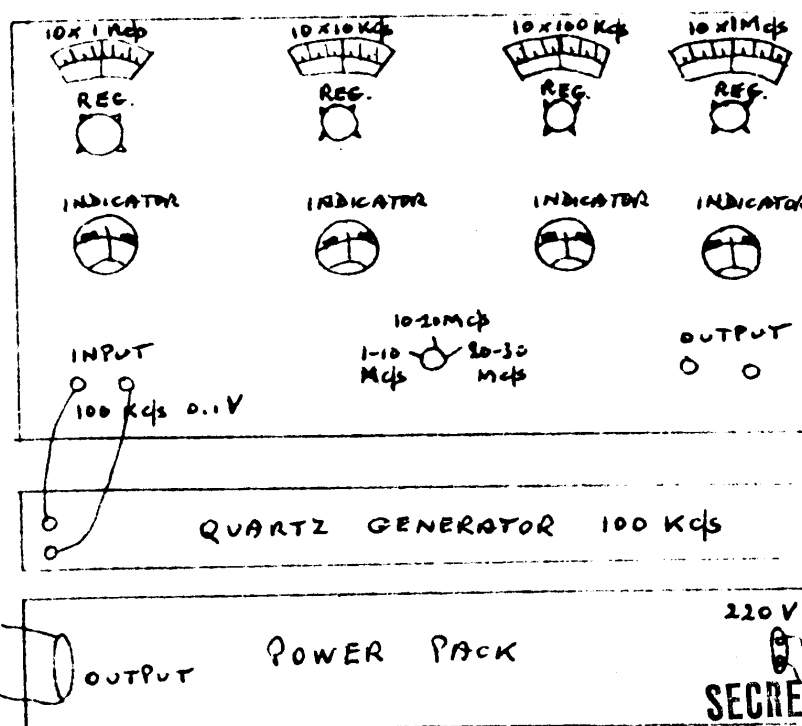
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The frequency range of this generator was from 1 kc to 30 Mc, in steps of 1 kc. The output voltage was 100 mV.

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The synchronization holding range was about 50 kcs, i.e. when re-tuning the generator, there was no intermediate frequency, but only steps of 100 kcs, when the discriminator regulated quite effectively the reactance valve and the latter gave such changes of capacity or induction, which made it possible to adjust the frequency of the generator to the required degree. Accidental changes in the input tension or mains tension also did not cause any break in the vibrations of the generator. The harmonic level did not exceed 1 per mille of the signal level throughout the whole range.

Sketch of the layout of a Decade Frequency Generator

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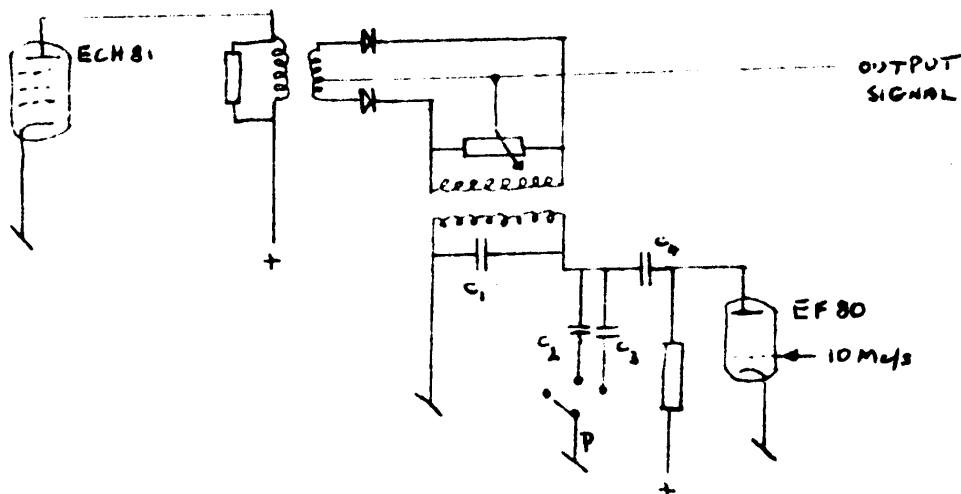
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Description of the instrument

The instrument consists of three parts:

A quartz generator giving 100 kcs at 0.1 V. This source has very low resistance and supplies a certain power for this generator /this sentence is not very clear - transl./.

The decade generator is regulated with the help of four decades and a switch, which switches on an additional mixer using germanium diodes, constructed as follows:



C₄ capacitor blocking the d.c. (KONDENSATOR ODDZIELAJACY
SILADOWA STALA) C₄ = 1000 pF

C₁ 8 pF capacitor giving resonance for the frequency 30 Mc/s

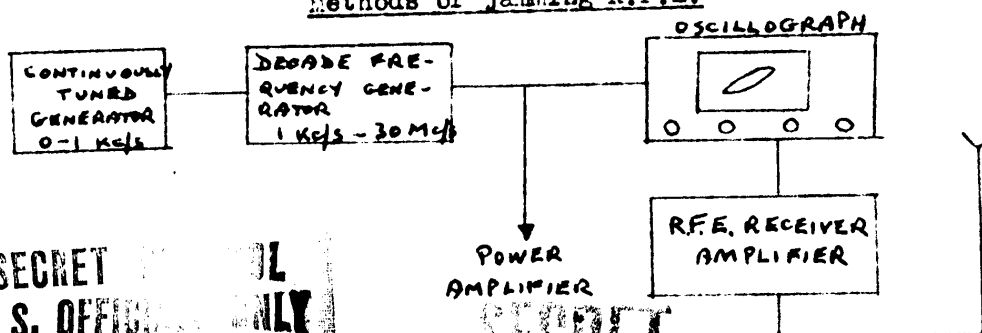
C₂ " " " " " " 20 Mc/s

C₃ " " " " " " 10 Mc/s

P frequency range switch

Use

1. Used on military airfields, for DF and communication
2. Exact fixing of the frequencies used by the enemy. For this purpose, the following arrangement is employed (also used for fixing the frequency of Radio Free Europe)

Methods of jamming R.F.E.**SECRET**
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After determining the exact frequency of the transmitter to be jammed, the Decade Frequency Generator was switched over to a power amplifier modulated with rushing noises and special interference recorded on magnetic tape. In this way, it was possible to obtain an exact coincidence of the interference with the transmitter. The interference on magnetic tape was obtained by playing back human speech at a rate 4 to 10 faster than normal.

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